OPERATORS MANUAL
FOR THE
LH 665 VRT

SERIAL APPLICATION CONTROL

LH No. 020-801-UK Version 1.00

LH Technologies Denmark ApS
Mølhavevej 2
9440 Aabybro
Denmark
Tel. +45 9696 2500
Fax. +45 9696 2501

Internet: *http://www.lh-agro.com/*

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Introduction

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INTRODUCTION

Congratulations on purchasing the LH 665 advanced DGPS computer.

The LH 665 is an advanced and reliable product, which, - if used in accordance with this manual – will prove to be a reliable tool for many years to come.

Your new LH 665 is designed to be user friendly, which makes operation easy – in the form of a large screen, and clearly marked back-lit keys. The LH 665 is furthermore, upgradeable via a PCMCIA card, which ensures that you can implement future developments without having to remove the unit from the vehicle.

The LH 665 can be used for yield monitoring as well as application control and navigation purposes. The LH 665 can furthermore be used with DGPS for precision farming purposes.

This operator's manual is split up so that each function is described individually.

We recommend, that you start by reading the chapter concerning **operating the LH 665.** After reading this chapter, You will feel more comfortable operating the LH 665, which will give you a good foundation for delving further into the LH 665 as described in the remaining chapters describing the individual functions.

A machine-setting chart is included in this manual. This machine setting chart contains information needed for correct operation and will, as a rule, be filled in by the engineer when the unit is fitted.

We have endeavoured to deliver a fault free product. To ensure optimal use of the equipment we ask that great attention be paid when reading the manual. We are more than happy to help should any queries arise, both when the product is used for the first time and at any later date. Regarding responsibility for use of the product we refer to our sales and delivery terms especially paragraph 7, which follows:

7. Product usage.

- Any use of the product is at the sole risk of the buyer. The buyer is therefore not entitled to any form for compensation caused by, for example, any of the following:
- Disturbance to/from any electronic services or products that do not confirm to the standards for CE marking,
- Missing or poor signal coverage or a succession hereof from external transmitters/receivers, used by the buyer,
- Functional faults, which apply to or from a PC-program or PC-equipment, not delivered by the seller,
- Faults that may arise from the buyers negligence to react to warnings and fault messages from the product, or which can be traced to negligence and/or absent constant control of the work carried out in comparison to the planned job.

7.2 When implementing any new equipment the buyer must take great care and pay attention. Any doubts as to correct operation/use should result in contacting the sellers service department.

This manual may not be altered, copied or manipulated in any way. Unoriginal manuals can lead to operational faults damaging machines or crops as a consequence thereof. LH Agro can therefore not be held responsible for damages incurred, which can be traced to the use of unoriginal or manipulated manuals. Original manuals can be requisitioned at any time from LH Agro.

With regards

LH Technologies Denmark ApS
Mølhavevej 2
9440 Aabybro
Denmark
Tel. +45 96 96 25 00
Fax. +45 96 96 25 01

MACHINE SETTING CHART

Machine setting chart:		Dealer:	
Fitting date: (Not encoded)			
Machine type: (Not encoded)			
Monitor –serial number:		Box calibration:	
GPS Check Sum	**OFF**	Volt calibration:	
Primary speed sensor	**GPS**	Controller make:	
Secondary speed sensor	**WHEEL**	Controller model:	

! Ensure that the above settings are encoded before work commences.

General operation

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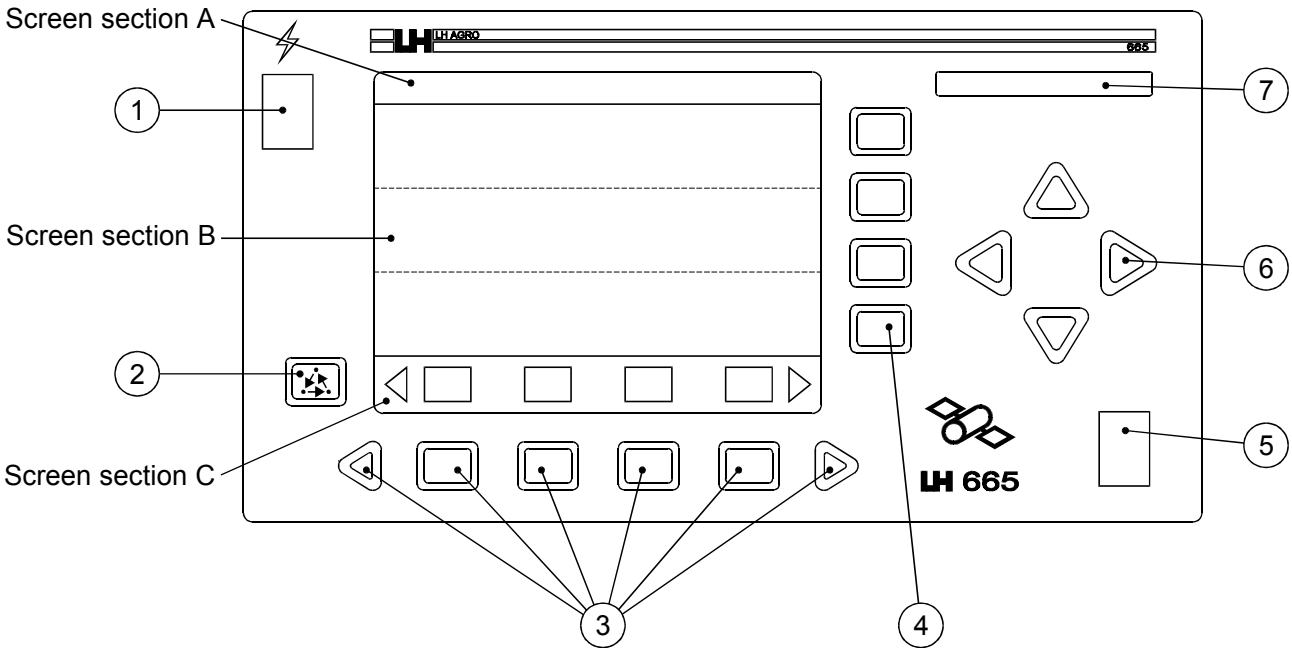
OVERVIEW



Pos.	Description
1	ON/OFF switch.
2	Menu key.
3	Menu selection keys.
4	Function keys.
5	Arrow keys.
6	Area override switch.
7	PCMCIA –drive for data cards.

OPERATING THE LH 665

ON/OFF SWITCH (POS. 1)

The LH 665 is switched on and off with the switch positioned in the upper left-hand corner. The computer will not react if the computer is switched off by mistake whilst, e.g. copying data until the task is finished.

Note! The possibility to make a back up of data to a data card is given every time the LH 665 is switched off. Copying the data to a data card is necessary if the unit is used in connection with DGPS to produce field maps. Press the COPY key if this is desired. If no backup is required then simply press the CANCEL key.

AREA OVERRIDE SWITCH (POS. 5)

The switch in the lower right-hand corner is used for manually stopping the area counter. The area counter status is shown on the display.

Note! The computer controlling the implement is fitted with a sensor that automatically starts and stops the area counter dependant on the implement status. The manual area override switch should only be used, therefore, when the signal from the automatic sensor is not desired.

THE SCREEN

The screen is split into three sections. The top section (A) always shows the field, load, DGPS status and the data card status.

The middle section (B) shows the functions selected using the function keys (pos. 4).

The lower section (C) shows the function of the menu selection keys (pos. 3); the grain type being harvested and the area count status.

The middle section (B) can also be split into two using the SHOW/HIDE MAP key. Pressing the SHOW MAP key will display a map of the field if DGPS equipment is connected.

USING THE KEYS

The LH 665 is operated using “soft keys” (the function of the key changes in relation to the operating program). There are four main groups; **arrow keys**, **function keys**, **menu key**, **menu selection keys**.

ARROW KEYS (POS. 6)

The UP, DOWN, LEFT and RIGHT arrow keys on the right-hand side of the panel are used to select and alter a setting. The right and left arrow keys at the bottom of the panel are used to page through the menu selections and are never used to select or alter a setting.

An arrow symbol is displayed in the main operating screen next to the field or the load; this symbol indicates what is altered by pressing the arrow keys.

FUNCTION KEYS (POS. 4)

Screen section B on the LH 665 has four sub-sections. The function/information displayed in these sections is determined with the function keys.

To alter the displayed function/information, the sub-section has to be selected. The four sub-sections are next to the function keys and pressing one of the function keys will highlight the section that corresponds to the function key.

Once a section has been highlighted, use the menu election keys to determine which function/information the section will have. Pressing the lower arrow keys pages through the available functions/information.

Some functions, e.g. working width, also display an arrow symbol on the right-hand side of the function. This indicates that the function can be altered using the ARROW UP/DOWN keys. Press the function key to the right of the function to leave this function.

MENU KEY (POS. 2)

Repeatedly pressing the menu key alters the function of the menu keys. It is possible to page through the available menus by pressing the MENU key.

Key	Function
	Repeatedly pressing this key pages through the following options: FIELD LOAD HIDE MAP OPTIONS CAL SETUP DIAG.

MENU SELECTION KEYS (POS. 3)

The function of the menu selection keys alters depending on what is being done on the computer.

The horizontal arrow keys at the bottom of the panel are used to display more menu options. An arrow displayed over the lower arrow keys indicates that pressing the arrow keys will display more options.

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IMPORTANT

Correct encodement and calibration of the LH 665 are essential before correct operation of the following functions.

The procedure for encoding and calibration of the LH 665 are described in the respective chapters in this operator's manual.

THE APPLICATION CONTROL PROGRAM

The most important functions for application control are:

Application rates

- Target rate
- Actual rate
- Average actual rate
- Total units

Area

- Area covered for the field
- Actual working width
- Hectare per hour

Forward speed

- Kilometres per hour
- Distance

Other functions

- Date and time
- Map zoom

DATA PER FIELD

All application control data is connected to a **field number**, this is to ease data registration.

- **Each field has a number and can be given a name.**
- **Each field can use only one application task.**
- **Each field can be split into loads.**
- **Each load can be, e.g. a spreader full, a hopper load, etc.**
- **Each load has a number and can be given a name.**
- **The sum of, i.e. the area, the distance, etc. for each individual load, is equal to the total for the field.**

OPERATION

SETTING THE LH 665 TO APPLICATION CONTROL

The LH 665 may need setting up for application control. The following procedure sets the computers "operating mode".

Step	Key	Procedure
1		Press the MENU key until the following menu selection keys appear at the bottom of the display (screen section C): **CAL** **SETUP** **DIAG**
2	**SETUP**	Press the SETUP key to display the following: **SWATH** **MARKS** **CROP** **CARD**
3		Press the lower ARROW keys until the following is displayed: **LOAD** **VEHICLE** **CONSOLE** **MEMORY**
4	**CONSOLE** 	Press the MONITOR key and this screen is displayed: **CONSOLE SETUP** **Operating Mode** **APPLICATION RATE** **Day/Month/Year** **1/06/1999** **Time** **11:23** **Serial Number** **9800085** **Box cal.** **774** **Voltage cal.** **487** **GPS Check Sum** **OFF** **Field Marker input** **INTERNAL** **EDIT** **EXIT** Use the ARROW UP/DOWN keys to highlight **Operating Mode**.
5	**EDIT** 	Press the EDIT key and select **APPLICATION RATE** using the ARROW UP/DOWN keys.
6	**ACCEPT**	When **APPLICATION RATE** has been selected under **Operating Mode** press the ACCEPT key.

DEFINING FIELDS BEFORE START

It is practical to encode all fields (with names if required) before work commences.

Field numbers are controlled by the LH 665 and are shown on the upper left-hand side of the display (screen section A) (F1:, F2:,etc). To the right of the field number a name of max. 8 characters can be encoded (i.e. F1: TOPFIELD).

It is easiest to use the field numbers that are allocated in the farm's field plans if this is possible. In practice many fields in the field plans are split up into smaller "part" fields and these lots are allocated an extra level, e.g. F1.1, F1.2, etc. In these cases, the field name in the LH 665 can be utilised to organise the field numbers in the LH 665 in relation to the field numbers in the field plans.

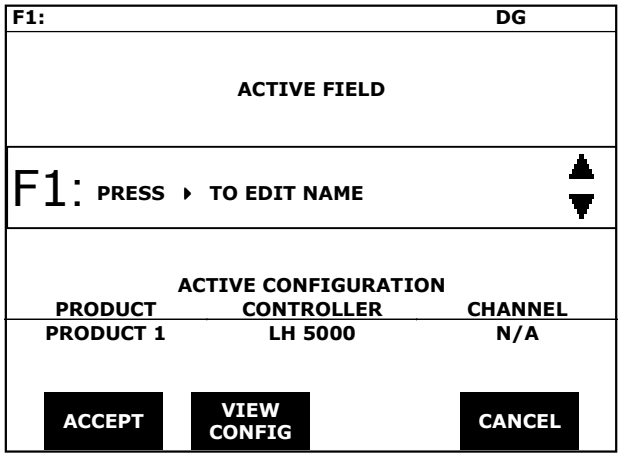
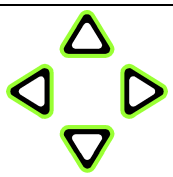
Example:

Field no. in the LH 665	Field name in the LH 665
F1:	F1.1
F2	F1.2
F3	F2

The field number encoded in the field name is the same as the field number in the farm's field plans.

255 fields can be stored in the LH 665. *Do not start more fields than necessary in the LH 665, as they cannot be deleted individually and take up space in the memory.*

STARTING AND NAMING FIELDS

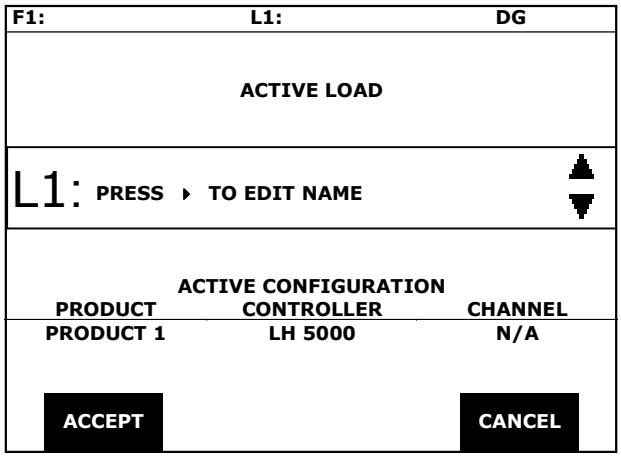
Step	Key	Procedure
1		Press the MENU key until the following menu selection keys appear at the bottom of the display (screen section C): **FIELD** **LOAD** **HIDE MAP** **OPTIONS**
2	**FIELD**	Press the FIELD key twice to show the following screen: 
3		If there is not a rectangular box around the field section press the function key to the right of the section.
4		Press the right ARROW key to move the cursor and use, thereafter, the ARROW UP/DOWN keys to select the letter. Move the cursor to the right using the right ARROW key. The field name can have max. 8 characters. If the active configuration is correct, press the ACCEPT key.
5	**VIEW CONFIG**	If the configuration is incorrect and needs changing, press the VIEW CONFIG key and follow the steps 4 to 7 as described on page 3.7.
6	**ACCEPT**	Press the ACCEPT key.

START NEW FIELD

Step	Key	Procedure
1		Follow steps 1 – 3 as described above.
2		Press the ARROW UP key until **CREATE NEW FIELD** is displayed. Name the field and select the correct crop type as described above, press the ACCEPT key.

START NEW LOAD

The procedure for starting new loads is almost the same as described above for starting new fields.

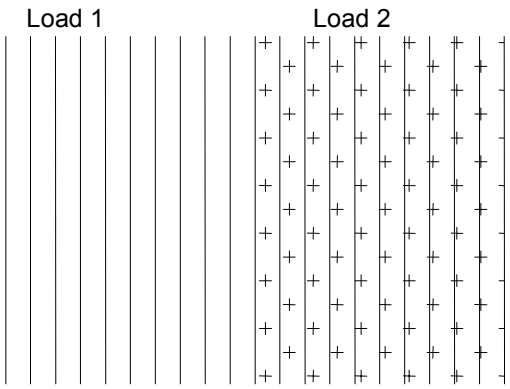
Step	Key	Procedure
1		Press the MENU key until the following menu keys are displayed at the bottom of the screen (screen section C). **FIELD** **LOAD** **MARKS**
2	**LOAD**	Press the LOAD key twice to display the following screen: 
3		The loads can be named and the procedure for this is the same as for naming fields.
4	**ACCEPT**	Press the ACCEPT key.

Note! We recommend creating new loads as the need arises and not like fields before harvest.

USING LOAD NUMBERS

Typically the fields will be worked as one load. It is not necessary to split the fields into loads unless it is required. The following example shows a field split into two loads.

Example of a field split into two loads:



This example shows how it is possible to split a field into two different loads.

The marked area (load 2) shows an area of the field that was, e.g. wet.

CHANGING BETWEEN THE ENCODED FIELD AND LOAD NUMBERS

Small arrows are shown to the left of the field/load number (screen section A). The field numbers can be paged through if the arrows are to the left of the field number. If however the arrows are to the left of the load number then paging though the loads is possible.

CHANGE FIELD

If the small arrows are not to the left of the field number, pressing the FIELD key allows paging through all fields using the ARROW UP/DOWN keys.

Press the ACCEPT key to accept the field.

CHANGE LOAD

If the small arrows are not to the left of the load number, pressing the LOAD key allows paging through all fields using the ARROW UP/DOWN keys.

Press the ACCEPT key to accept the load.

SELECTING THE TARGET FILE

To select the file used for the application task, do as follows:

If the LH 665 is to be used for logging data only and not controlling the application rate, select **NONE** when selecting the target file.

Step	Key	Procedure
1		Press the MENU key until the following menu selection keys appear at the bottom of the display (screen section C): **FIELD** **LOAD** **SHOW MAP** **OPTIONS**
2	**FIELD**	Press the FIELD key twice.
3	**VIEW CONFIG**	Press the VIEW CONFIG key.
4	**EDIT TGT FILE**	Press the EDIT TGT FILE key.
5	**ACCEPT**	Select the target file using the ARROW UP/DOWN keys and press the ACCEPT key (the file information can be viewed by pressing the VIEW INFO key).
6	**ACTIVE ON/OFF**	Press the ACTIVE ON/OFF key and a "tick" will appear in the ACTIVE box on the display.
7	**EXIT**	Press the EXIT key.
8	**ACCEPT**	Press the ACCEPT key.

MARKERS

The internal markers in the LH 665 are used together with DGPS positions to mark positions in the field whilst working, i.e. wet areas, weeds, stones, etc.

Step	Key	Procedure
1		Press the MENU key until the following menu selections keys are displayed at the bottom of the screen (screen section C): **FIELD** **LOAD** **SHOW MAP** **OPTIONS**
2	**MARKS**	Pressing the MARKS key displays the following: **MARK 1** **MARK 2** **MARK 3** **MARK 4** The marker name and type can be altered, and the procedure for this is described in the ENCODE chapter under MARKER SETUP. CONTINUOUS marking is started and stopped by pressing the key. SPOT marking is started by pressing the key and stops automatically after a few seconds. The LH 665 beeps and the marker being used flashes when one or more markers are being used.

THE CONNECTION BETWEEN FIELD AND LOAD KEYS

The following example shows how, amongst others, the total weight shown is affected when the LOAD key is pressed or not:

Step	Key	Procedure
1		Press on of the four FUNCTION keys to highlight a section on the screen.
2		Whilst the section is highlighted press the lower ARROW keys until the WEIGHT key is shown, then press this key.
3		Press the MENU key until the following menu selection keys are shown at the bottom of the display (screen section C): **FIELD** **LOAD** **SHOW MAP** **OPTIONS**
4	**LOAD**	The total units for the load can be seen when the LOAD key is pressed. If the total units for another load is to be seen then change the load (see page 3.7).
5	**FIELD**	The total units for the field can be seen when the FIELD key is pressed. If the total units for another load is to be seen then change the load (see page 3.7). It is possible to switch between showing information for a field or a load.

FUNCTION KEYS

All function keys are displayed in the following manner:

Step	Key	Procedure
1		Screen section B is split up in four sub-sections. Each sub-section has a corresponding function key to the right of the screen. Press one of the function keys to highlight one of the sub-sections.
2		Pressing the lower ARROW keys whilst the sub-section is highlighted displays the available function keys. Pressing one of these keys will change the function to the selected and the display will return to normal.

TARGET RATE

Step	Key	Procedure
1	TARGET RATE	XX.XX x/ha The target rate for the present position in the field. This can be set to automatic (where the amount to be applied is taken from the target file selected) or manual (where the amount to be applied can be manually adjusted in steps, the size of the steps is encoded as described on page 4.4). Select between automatic or manual target rate using the LEFT/RIGHT ARROW keys.

ACTUAL RATE

Step	Key	Procedure
1	ACTUAL RATE	XX.XX x/ha The actual rate (from the controller). When the implement sensor is active (not counting area) the average rate is displayed.

AREA

Step	Key	Procedure
1	AREA	XX.XXX ha The worked area for the present field or load.

WORKING WIDTH

Step	Key	Procedure
1	SWATH	X.XX M The present working width in metres sent from the implement controller.

Press the lower RIGHT ARROW key to display more functions.

TOTAL UNITS

Step	Key	Procedure
1	TOTAL UNITS	XXXXX units Total units for the present field or load.

GROUND SPEED

Step	Key	Procedure
1	GROUND SPEED	XX.X km/hr The actual speed displayed in kilometres per hour.

AREA PER HOUR

Step	Key	Procedure
1	AREA PER HR	XX.X ha/hr The present work rate displayed in hectares per hour.

DISTANCE

Step	Key	Procedure
1	DISTANCE	XXX M The measured distance for the present field or load (the distance displayed is normally for the load and will only be displayed for the whole field when the field key is displayed).

Press the lower RIGHT ARROW key to display more functions.

TGT FILE RATE

Step	Key	Procedure
1	**TGT FILE RATE**	XX.X Units/ha The application rate as defined by the target file. This function can be used if the target rate has been set to manual and the rate from the file is required to be seen.

GPS INFORMATION

Step	Key	Procedure
1	**GPS INFO**	**This function presupposes that GPS equipment is connected.** SAT X The number of satellites that positional signals are being received from. FRQ X.X The frequency of the positional transmitter (beacon or geo-stationary transmitters). DIFF/OFF Differential signal status. SNR X.X Signal to Noise Ratio for beacon or geo-stationary systems.

LAT/LON

Step	Key	Procedure
1	**LAT LON**	**This function presupposes that GPS equipment is connected.** XX.XXXXXX N Latitude displayed in degrees, minutes and ten thousands of a minute. XX.XXXXXX E Longitude displayed in degrees, minutes and ten thousands of a minute.

COMPASS HEADING

Step	Key	Procedure
1	**COMPASS HEADING**	**This function presupposes that GPS equipment is connected.** X.X deg The direction of travel expressed as degrees. When driving north the compass heading is 0.0 degrees, when driving east the compass heading will be 90.0 degrees.

Press the lower RIGHT ARROW key to display more functions.

ELEVATION

Step	Key	Procedure
1	ELEV	**This function presupposes that GPS equipment is connected.** XXX M The height above sea level displayed in metres.

CARD INFORMATION

Step	Key	Procedure
1	CARD INFO	XX.X % SPACE FREE The logging time in percent remaining on the data card.

DATE/TIME

Step	Key	Procedure
1	DATE TIME	DATE XX/XX/XXXX The present date. TIME XX:XX The present time.

TARGET FILE

Step	Key	Procedure
1	TARGET FILE	Information contained in the selected target file.

Press the lower RIGHT ARROW key to display the last functions.

FIELD NAME

Step	Key	Procedure
1	FIELD NAME	XXXXXXXX The selected field's name.

LOAD NAME

Step	Key	Procedure
1	LOAD NAME	XXXXXXXX The selected load's name.

LIGHT BAR PASS NUMBER

Step	Key	Procedure
1	LIGHTBAR PASS #	X A-B The present pass number.

MAP ZOOM

Step	Key	Procedure
1	MAP ZOOM	XXX m When in automatic zoom, the map on the screen will automatically zoom in or out to fill as much of the screen as possible. Pressing the RIGHT arrow key allows for manual zoom of the map. Use the ARROW UP/DOWN keys to zoom in or out. Pressing the LEFT arrow key returns the map zoom function to automatic zoom.

DIAGNOSTICS

It is possible to see various information in the diagnostic menus for faultfinding purposes.

Each diagnostic menu can be left by pressing the EXIT key.

The displayed information and what it can be used for is described in the chapters that concern the information.

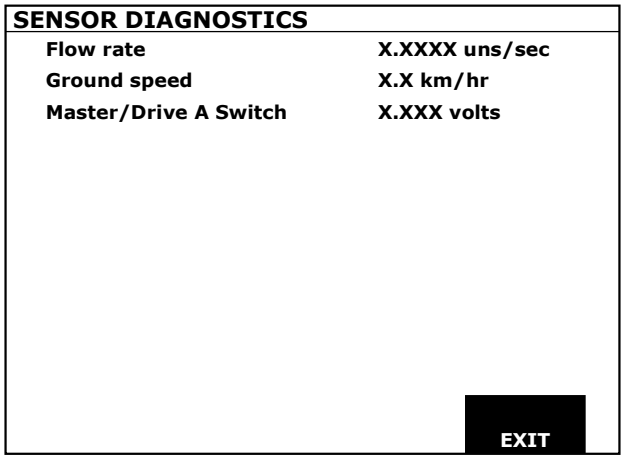
Step	Key	Procedure
1		Press the MENU key until the following menu selection keys are displayed (screen section C): **CAL.** **SETUP** **DIAG**
2	**DIAG** 	Press the DIAG key to display the following menu selection keys (page through the available diagnostics using the LEFT/RIGHT ARROW keys): **SYSTEM** **SENSORS** **GPS** **RAW NMEA**

SYSTEM DIAGNOSTICS

Step	Key	Procedure
1	**SYSTEM**	Press the SYSTEM key to display the following: **SYSTEM DIAGNOSTICS** **Hardware version** **Vesta: 1.7** **Serial number** **9800085** **ROM version** **2.21** **Program version** **4.1.2** **Operating memory** **18944 bytes** **Storage memory** **314566 bytes** **Vehicle battery** **13.7 Volts** **EXIT**

SENSOR DIAGNOSTICS

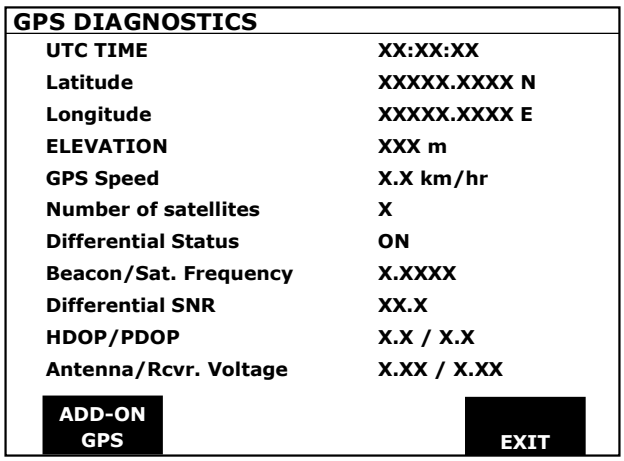
Step	Key	Procedure
1	SENSOR	Press the SENSOR key to display the following:



GPS DIAGNOSTICS

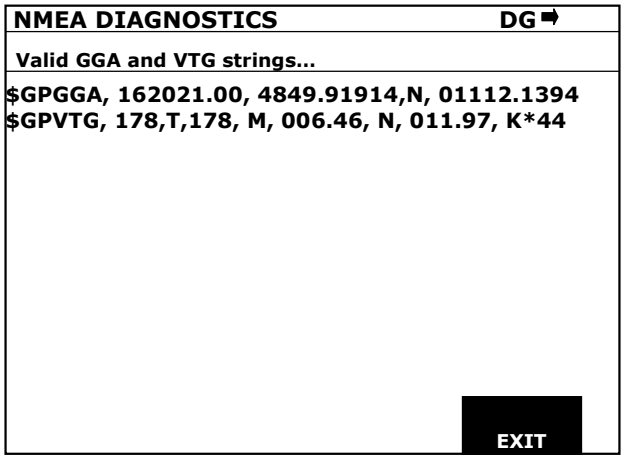
More information about the following two diagnostic menus can be found in the DGPS chapter in this manual.

Step	Key	Procedure
1	GPS	Press the GPS key to display the following:



Pressing the ADD-ON GPS key displays information for the LH ADD-ON GPS module. This key has no function if no such module is fitted.

RAW NMEA

Step	Key	Procedure
1	**RAW NMEA**	Press the RAW NMEA key to display the following:  GGA and VTG strings are not shown if a LH ADD-ON GPS-module is fitted, as the positional signals from these modules use a different format.

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ENCODE

The necessary values for application control are encoded in the following menus.

ENCODE MENUS/VALUES

All encodements are selected as follows (presupposes **APPLICATION CONTROL** is selected under **Operating Mode** as described on page 3.3):

Step	Key	Procedure
1		Press the MENU key until the following menu selection keys are displayed at the bottom of the screen (screen section C): **CAL** **SETUP** **DIAG**
2	**SETUP**	Press the SETUP key.
3		Page through the available encode menus using the lower ARROW keys: **APP RATE CONFIG** **MARKS** **CARD** **LOAD** **CONSOLE** **MEMORY** **GPS** **MAP**

When encoding a numerical value simply pressing the arrow keys will move the cursor to the next digit, e.g. if a value of 12.4 is to be encoded, use the left arrow key to select the first digit (1) arrow up until 1 is displayed. Now move the cursor to the right using the right arrow key and encode the value 2, move the cursor to the right again.

CREATING A CONTROLLER FOR APPLICATION CONTROL

The following procedure should be followed to "create" an implement controller in the LH 665:

Step	Key	Procedure
1		Press the MENU key until the following menu selection keys appear at the bottom of the display (screen section C): **CAL** **SETUP** **DIAG**
2	**SETUP**	Press the SETUP key to display the following: **APP RATE CONFIG** **MARKS** **CARD** **LOAD**
3	**APP RATE CONFIG**	Press the APP RATE CONFIG key.
4	**CREATE NEW** 	Press the CREATE NEW key and the following is displayed: **APP RATE CONFIG** **Controller Make** **LH AGRO** **Controller Model** **LH 5000** **Product** **PRODUCT 1** **Units** **KG** **Ground Speed Sensor** **GPS** **App Distance From GPS** **0 ft fwd** **Full Swath** **From Controller** **Tgt Units:Controler Units** **1:1.0000** **Target Rate Increment** **1.0** **Actual Rate Scale Factor** **1.000** **EDIT** **EXIT** Use the ARROW UP/DOWN keys to highlight the required encodement.
5	**EDIT** 	Press the EDIT key and select the required value using the ARROW UP/DOWN keys.
6	**ADVANCED SETTINGS**	Press the ADVANCED SETTINGS key to alter any of the advanced settings described on page 4.5.

Controller Make/Model:

Select **LH AGRO** as the **Controller Make** and **LH 5000** as the **Controller Model**.

Product:

Select the product to be used. The name of the product can be edited in the second screen that appears when the EDIT key has been pressed.

Units:

Select the units to be used in the main operating screen. If the unit of measure to be used is **KG**, it is necessary to select another unit of measure, return to the main operating screen, then return back to setup and alter the unit of measure to **KG**. This will be fixed in later version.

Ground Speed Sensor:

As the LH 665 is not fitted with any wheel sensor **GPS** must be selected as the Ground Speed Sensor. Forward speed will be calculated via the DGPS signals the LH 665 receives.

App Distance From GPS:

This is the distance in feet (3 feet = approx. 1 metre) from the DGPS antenna to the position that the aggregate is applied.

Example:

The DGPS antenna is fitted on the top of the tractor cab, a fertiliser distributor is being used and the fertiliser hits the ground 20 metres behind the spreader. The distance from the DGPS antenna to the back of the fertiliser spreader is 4 metres.

The distance to be entered is; 20 metres + 4 metres = 24 metres (approx. 72 feet).

As the implement is behind the antenna this should be entered as **72 Ft back.**

Full Swath:

This cannot be altered in this version.

Tgt Units:Controller Units:

The default setting is 1:1.0000. This ratio is used to convert the units in a target file to the units of application for the aggregate. **DO NOT ALTER THIS SETTING**.

Target Rate Increment:

This setting determines how much the application rate is increased/decreased by when in manual mode.

Actual Rate Scale Factor:

The default setting is 1.000. This setting is used if problems arise in the logged file (*.yld) due to large application amounts.

If the setting is 1.000 the actual rate in the log file will correspond to the actual rate.

If the setting is 0.100 the actual rate in the log file will correspond to 10% of the actual rate.

If the setting is 0.010 the actual rate in the log file will correspond to 1% of the actual rate.

ADVANCED SETTINGS

Target Rate Outside Field:

The default setting is **Zero**. This setting is used to determine what rate should be applied if the implement is outside the field boundary (from the target file).

When the default setting (**Zero**) is used and the implement is not in the field boundary, the application rate will be set to 0.

If **TGT default** is selected then the default rate (from the file) will be used if the implement is not in the field boundary.

If **Use last** is selected then the last rate applied before the implement left the field boundary will be used.

Controller Time Delay:

The time, in seconds, the implement takes to adjust the present rate to a newer rate.

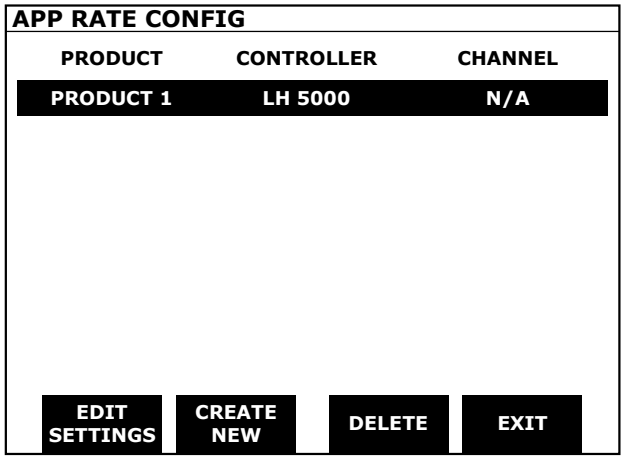
Actual Rate Units:

Ignore this setting.

Log Actual Rate:

The default setting is **YES**. If no log of what has actually happened in the field is required set this to **NO**.

APPLICATION CONTROL SETUP

Step	Key	Procedure
1	APP RATE CONFIG	Press the APP RATE CONFIG key and this screen is displayed: 
2		Highlight the controller that is to be encoded using the ARROW UP/DOWN keys.
3	EDIT SETTINGS	Press the EDIT SETTINGS key if any of the settings for the selected controller are to be altered (see above for description of settings).
4	CREATE NEW	Pressing the CREATE NEW key creates a new controller as described on page 4.3.
5	DELETE	Press the DELETE key if a controller/product is to be deleted.
6	EXIT	When the controller settings are correct press the EXIT key.

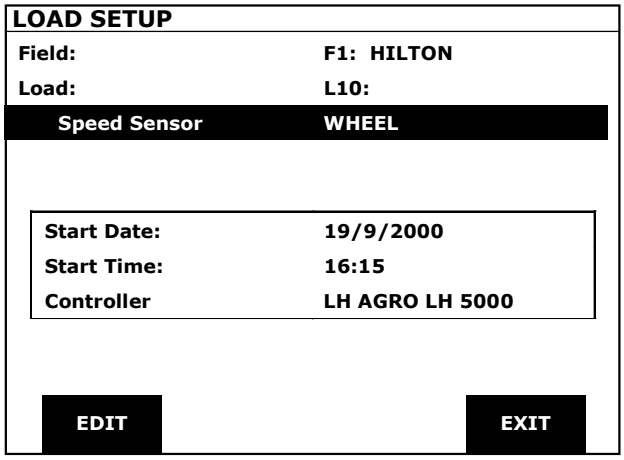
MARKER SETUP

Step	Key	Procedure
1	**MARKS**	Press the MARKS key and the following is displayed: **MARKER SETUP** MARK / NAME / TYPE MARK 1 — Stones — SPOT MARK 2 — Weeds — CONTINUOUS MARK 3 — Draining — CONTINUOUS MARK 4 — Other — SPOT **EDIT NAVN** **EDIT TYPE** **EXIT**
2		Highlight the marker to be encoded with the ARROW UP/DOWN keys.
3	**EDIT NAME** **SAVE NAME**	After pressing this key the name of the marker can be changed using the ARROW UP/DOWN keys. Move the cursor from letter to letter using the RIGHT/LEFT ARROW keys. Press the SAVE NAME key when the marker name is encoded. *The marker name does not affect how the marker is registered in the LH 665. All markers are registered as marker 1-4 in the LH 665 and mapping software. We recommend therefore, noting which marker is associated to which marker name.*
4	**EDIT TYPE** **ACCEPT**	It is possible to change the marker type by pressing the EDIT TYPE key. **CONTINUOUS** and **SPOT** markers can be selected by using the ARROW UP/DOWN keys. Press the ACCEPT key once the marker type have been encoded. *CONTINUOUS marking is started and stopped by pressing the marker key during operation.* *SPOT marking is started by pressing the marker key during operation and stops automatically after a few seconds.*
5	**EXIT**	When all the marker names and marker types have been encoded press the EXIT key.

DATA CARD SETUP

As many data card and data management functions are the same for all operating modes in the LH 665, the functions are described in the DGPS and DATA CARD AND DATA MANAGEMENT chapters in this manual.

LOAD SETUP

Step	Key	Procedure
1	LOAD	Press the LOAD key and this screen is displayed: 
2		Highlight the setting to be changed using the ARROW UP/DOWN keys.
3	EDIT	When the setting is highlighted, press the EDIT key.
4	ACCEPT	Alter the setting using the ARROW UP/DOWN keys and press the ACCEPT key.
5	EXIT	Press the EXIT key when all the settings are correct.

Speed sensor:

The sensor used for the selected load is encoded here. WHEEL is normally used.

CONSOLE SETUP

Step	Key	Procedure
1	CONSOLE	Pressing the CONSOLE key displays this screen:
2		Highlight the setting to be changed using the ARROW UP/DOWN keys.
3	EDIT	Press the EDIT key when the required setting is highlighted.
4	ACCEPT	Alter the setting using the ARROW UP/DOWN keys and press the ACCEPT key
5	EXIT	Press the EXIT key when all of the settings are encoded.

CONSOLE SETUP

Operating Mode	APPLICATION RATE
Day/Month/Year	3/10/2000
Time	14:00
Serial number	9900085
Box cal	774
Voltage cal	487
GPS Check Sum	OFF
Field marker input	INTERNAL
EPROM Language	English

EDIT EXIT

Operating Mode:

Select what the LH 665 is being used for. For bulk crop harvest select **HARVESTMASTER**, for grain harvest select **Grain Harvest**, for application select **APPLICATION RATE**, for boundary measurement select **Site Verification**.

Day/Month/Year:

Encode the present date.

Time:

Encode the present time.

Serial number, Box cal, Voltage cal.:

See the machine setting chart.

GPS Check Sum:

If the DGPS receiver sends a “check sum” then set this encodement to **ON**. The standard setting is **OFF**.

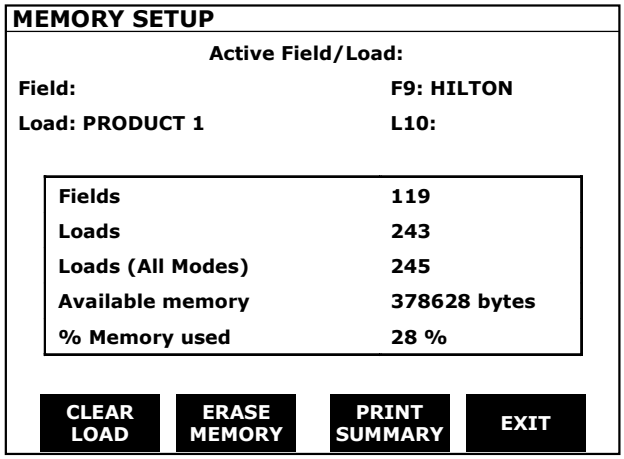
Field marker input:

Select whether the internal markers are used (select **INTERNAL**) or whether an external marking module is used (select **EXTERNAL**).

EPROM language:

Select the operating language of the LH 665.

MEMORY SETUP

Step	Key	Procedure
1	**MEMORY**	Press the MEMORY key to display this screen: 
2	**CLEAR LOAD**	Pressing this key allows selection of a load to be deleted. Pressing the CLEAR ALL key will delete all loads in **APPLICATION RATE** mode without deleting the field names.
3	**ERASE MEMORY**	Pressing this key removes all fields and loads from the memory. All field names will be erased; the kg-calibration for the individual crop types will be erased.
4	**PRINT SUMMARY**	Not available in this version.
5	**EXIT**	To leave this menu, press the EXIT key.

GPS SETUP

This key has no function unless an ADD-ON GPS model 3000, 3050, or 3100 is connected to the LH 665. If such a module is connected, please read the DGPS chapter. Leave this menu using the EXIT key.

MAP SETUP

Step	Key	Procedure
1	**MAP**	Press the MAP key to display this screen: **MAP SETUP** **Coverage Map** **ON** **Boundary Map** **ON** **Target Map** **ON** **EDIT** **EXIT**
2		Highlight the setting to be changed using the ARROW UP/DOWN keys.
3	**EDIT**	Press the EDIT key when the required setting is highlighted.
4	**ACCEPT**	Alter the setting using the ARROW UP/DOWN keys and press the ACCEPT key
5	**EXIT**	Press the EXIT key when all of the settings are encoded.

Coverage Map:

Leave this on the default setting of **ON** if a map is required to be displayed on the screen. If this is set to **OFF**, no map will be displayed on the screen.

Boundary Map:

Leave this on the default setting of **ON**. If a boundary map has been created using the BOUNDARY function, the field boundary will be displayed.

Target Map:

When this is set to the default setting of ON, a map will be displayed on the screen and erased

CALIBRATION

These menus allow calibration of the functions that are necessary for application control.

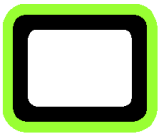
THE CALIBRATION MENUS

All the calibration menus are selected as follows (presupposes **APPLICATION RATE** is selected as the operating mode as described on page 3.3).

Step	Key	Procedure
1		Press the MENU key until the following menu selection keys are displayed **CAL** **SETUP** **DIAG**
2	**CAL**	Press the CAL key and the following calibration menu items will be displayed: **AREA** **DISTANCE**

AREA CALIBRATION

After working a field with a known area it is possible to calibrate the LH 665 so that the measured area is the same as the actual area. Differences in area arise when working, i.e. short work when conditions do not allow for continuous adjustment of the working width.

Step	Key	Procedure
1	**AREA**	Press the AREA key.
2		Press the top function key to select the field to be area calibrated. Select the field using the ARROW UP/DOWN keys.
2		Highlight the ACTUAL HA section with the function key and adjust the actual area to the known area using the ARROW UP/DOWN keys.
3	**PERFORM CAL**	Press the PERFORM CAL key when the actual area has been encoded. The measured area will be adjusted to be the same as the actual area.
4	**ACCEPT**	Press the ACCEPT key and select the next field for area calibration.
5	**EXIT**	Press the EXIT key when all required fields are area calibrated.

FORWARD SPEED

This calibration is for the secondary speed sensor only, which is not fitted as standard.

Step	Key	Procedure
1	**DISTANCE**	Press the distance key and the following is displayed: **DISTANCE CALIBRATION:** **SELECT SENSOR:** **WHEEL** **ENTER DISTANCE** **EXIT**
2		Select which sensor the LH 665 receives the secondary speed signal from (normally WHEEL, see the encodement chapter).
3	**ENTER DISTANCE**	Measure a 100-metre stretch and drive to the start mark. **HA ON** must be displayed (screen section C). Press the ENTER DISTANCE key.
4	**CLEAR DISTANCE**	Press the CLEAR DISTANCE key to reset the distance counter.
5	**START TRAVEL**	Press the START TRAVEL key and drive the measured 100-metre stretch. The distance travelled is counted.
	STOP TRAVEL	Stop exactly at the stop mark and press the STOP TRAVEL key.
6	**PERFORM CAL**	Adjust **ACTUAL DISTANCE** with the ARROW UP/DOWN keys to 100 m and press the PERFORM CAL key.
4	**ACCEPT**	PRESS THE accept KEY TO ACCEPT THE FORWARD SPEED CALIBRATION.
5	**EXIT**	Press the EXIT key twice when forward speed calibration is finished.

FAULTFINDING

Fault	Cause	Solution
The application rate on the implement controller =0:	No connection between the LH 665 and the implement controller.	Check the connection between the LH 665 and the implement controller.
	The LH 665 is receiving no DGPS signals.	See "No DGPS signal (D or G not displayed)" on page 4.15.
	The implement is outside the field boundary.	If the implement is outside the field boundary and the *"Target rate outside field"* setting is set to **Zero** the application rate will be = 0. See page 4.5
	The application rate from the target file = 0.	Check that the application rate for the area being applied.
The area measured in the LH 665 is not the same as the implement controller:	No connection between the LH 665 and the implement controller.	Check the connection between the LH 665 and the implement controller.
	GPS speed is different than actual forward speed displayed on the implement controller.	The accuracy of GPS speed varies depending on the quality of the DGPS receiver.
	The forward speed sensor on the implement controller has not been calibrated correctly.	Calibrate the forward speed sensor fitted to the implement controller.
	The LH 665 did not count area when the application rate is 0.	The LH 665 only measures area when the application rate is greater than 0.
	The working width (swath) displayed on the LH 665 = 0.	If the implement controller is working and the working width is greater than 0, check the connection between the LH 665 and the implement controller.
	The area override switch is "down" on the front of the LH 665	The area override switch must be "up" to measure area.

Fault	Cause	Solution
Nothing is shown on the display:	The main cable to the LH 665 is not connected or damaged	Check that the main cable is connected and not damaged.
	An external unit, i.e. a DGPS receiver is connected incorrectly.	Disconnect all external units and switch the LH 665 on. If the display on the LH 665 works then check the connections to the external unit.
	One of the LH 665 sensor cables is damaged or incorrectly connected.	Disconnect all sensors one by one until the display works. The last wire to be disconnected may be damaged.
No DGPS signal (D or G not displayed):	The DGPS receiver is not sending any signals to the LH 665.	Some DGPS receivers can take up to 15 minutes to "lock" on to a signal when they are started for the first time. Check that all connections are good and that the cable is not damaged.
	Wrong cable between the LH 665 and the DGPS receiver.	Both the LH 665 and the DGPS receiver can be damaged if the cable between the LH 665 and the DGPS receiver is incorrect.
	The DGPS receiver is connected to the wrong socket on the LH 665.	The DGPS receiver must be connected to "PORT 1" on the LH 665.

NOTES

DGPS

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DGPS OPERATION

This chapter describes operating the LH 665 in conjunction with DGPS for yield logging, field boundary measurement and application rate control.

There are many ways to show DGPS information in the LH 665 and they are described here, as these are common for all operating modes.

DGPS STATUS ON THE SCREEN

The current DGPS status is shown in the top right corner of the display, if logging positional data has been selected. The following describes various different status situations:

-- Shows that logging has been selected, but that no data is being transferred to the data card, e.g. the machine is stopped.

--➔ Shows that logging has been selected but that no positional signals are being received either from satellites or the differential transmitter.

DG➔ Shows that the LH 665 is receiving a GPS and a differential signal. The GPS receiver has a signal from at least 4 satellites (3 dimensional). The arrow indicates that the data is being logged to a data card.

DG As above, but the data is not being logged to a data card.

G➔ Shows that the LH 665 is receiving a GPS signal, but no differential signal. The GPS receiver is receiving signals from at least 4 satellites (3 dimensional). The arrow indicates that data is being logged to a data card.

Dg➔ shows that the LH 665 is receiving a GPS and a differential signal. The GPS receiver is receiving signals from 3 satellites (2 dimensional). The arrow indicates that data is being logged to a data card.

GPS DIAGNOSTICS

Step	Key	Procedure
1		Press the menu key until the following menu selection keys are displayed at the bottom of the screen (screen section C): CAL SETUP DIAG
2	DIAG	Press the DIAG key to display the following: DIAG SENSORS GPS RAW NMEA
3	GPS	Pressing the GPS key displays the following: GPS DIAGNOSTICS UTC TIME 16:18:02 Latitude 04850.1417 N Longitude 01112.1672 E Elevation 498 m GPS speed 0.0 km/hr Number of satellites 6 Differential Status ON Beacon/Sat. Frequency 0.0000 Differential SNR 0.0 HDOP/PDOP 1.2 / 0.0 Receiver Voltage 0.00 ADD-ON GPS EXIT Pressing the ADD-ON GPS key displays information about the ADD-ON GPS module. This key has no function if no such module is fitted.

UTC Time:

Greenwich Mean Time (GMT), the current time at Greenwich, England.

Latitude:

Latitude displayed in degrees, minutes and part minutes.

Longitude:

Longitude displayed in degrees, minutes and part minutes.

Elevation:

The height above sea level displayed in metres.

GPS Speed:

The present forward speed, calculated from, the DGPS receiver, displayed in kph.

Number of satellites:

Displays the number of satellites signals are being received from.

Differential Status:

ON or OFF shows whether differential signals are being received or not.

Beacon/Sat. Frequency:

Displays the frequency that differential signals are being received from when beacon or geo-stationary differential receivers are used.

Differential SNR:

The Signal to Noise Ratio shows the strength of the differential signal in relation to background interference. A suitable SNR is between 10 to 18 (the higher the better).

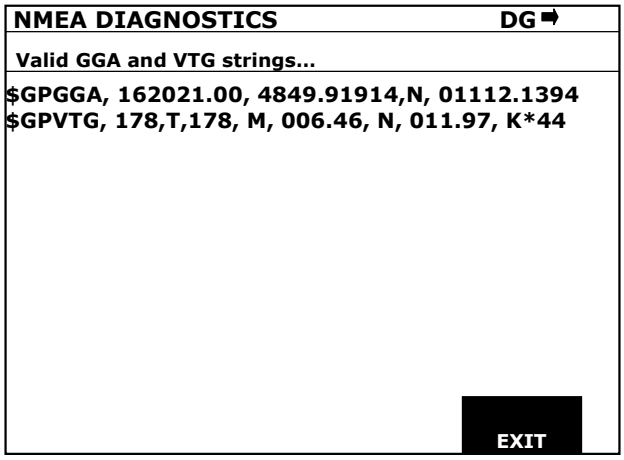
HDOP/PDOP:

HDOP expresses the quality of the horizontal GPS position. PDOP expresses the distance between the satellites signals are being received from. When the satellites are close to each other the PDOP value will be high and the positional data is not as accurate as a low PDOP.

Receiver Voltage:

If this shows 5 volts or higher then the antenna is not connected to the DGPS receiver (only if an ADD-ON GPS module is fitted). When the antenna is fitted correctly 0.5 or less is displayed.

RAW NMEA

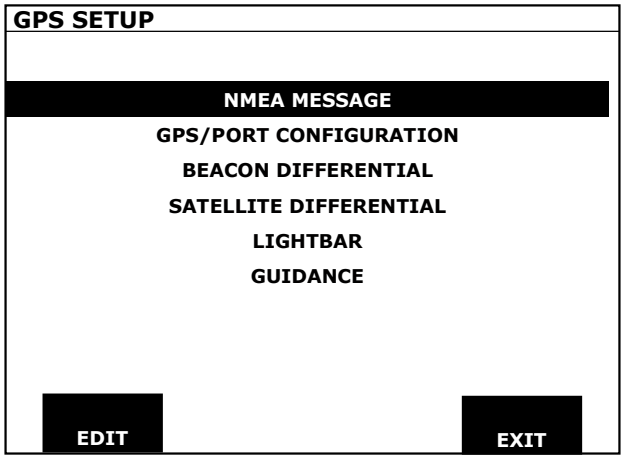
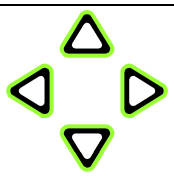
Step	Key	Procedure
1	RAW NMEA	The following screen is displayed when the RAW NMEA key is pressed:  The NMEA strings are not shown if an ADD-ON GPS module is connected.

DGPS ENCODEMENT

There are some things that must be set up before the LH 665 can log positional data to a data card. These settings are the same for all operating modes and we refer to the DATA CARD chapter in this operator's manual.

GPS SETUP

If an ADD-ON GPS model 3000, 3050 or 3100 is fitted there are some encodements needed for correct operation. A description of these encodements follows:

Step	Key	Procedure
1	GPS	Press the GPS key and this screen is displayed: 
2		Highlight the setting to be changed using the ARROW UP/DOWN keys.
3	EDIT	Press the EDIT key when the required menu is selected.
4	EXIT	When all GPS encodements are finished, press the EXIT key

NMEA MESSAGE

The ADD-ON GPS module uses the Trimble TSIP protocol for transmitting positional data to the LH 665. This means that NMEA strings are not used and are not shown under RAW-GPS diagnostics.

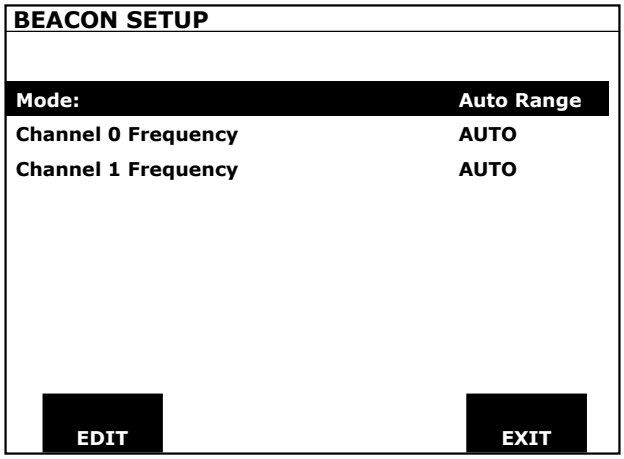
GPS/PORT CONFIGURATION

It is not necessary at present to change any of these settings and we recommend therefore that no encodements take place.

BEACON DIFFERENTIAL

Selecting this allows encodement of the beacon receiver (only available if an ADD-ON GPS module is fitted).

The beacon receiver can be encoded as to how it searches for differential signals. The three methods are selected thus:

Step	Key	Procedure
1		Highlight **BEACON DIFFERENTIAL** using the ARROW UP/DOWN keys.
2	EDIT	Press the EDIT key and this screen is displayed: 
3		Select which setting is to be altered using the ARROW UP/DOWN keys.
4	EDIT	Press the EDIT key when the required setting is highlighted.
5	EXIT	When the settings are encoded press the EXIT key.

Mode:

The beacon receiver has three possible methods of searching for a differential signal, which of the three possibilities depends on local conditions:

- *Auto Range*; Standard setting. The receiver finds and remembers the three closest beacon transmitters.
- *Auto Power*; the receiver finds and remembers the three beacon transmitters in the receiver range that send the strongest signal. The differential signal used will always be the strongest.
- *Manuel*; the two frequencies to be used must be manually encoded.

Channel 0/1 Frequency:

Encode the two frequencies that the beacon receiver is to receive signal on if MANUEL is selected under **Mode**.

Data cards and data management

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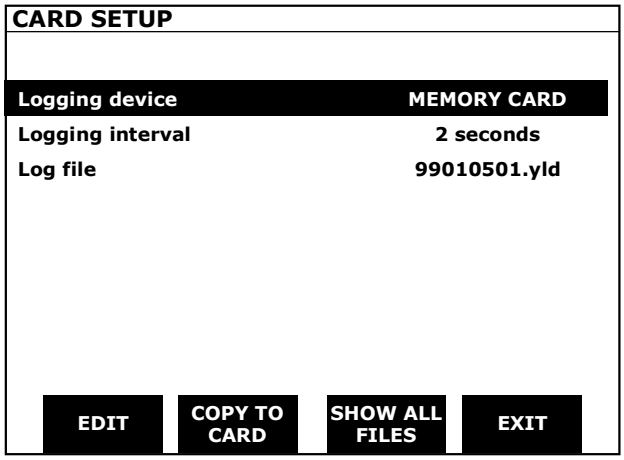
DATA CARDS

This chapter discusses all data card related functions found in the LH 665. This chapter is for all operating modes as all data card functions are almost the same for all operating modes

DATA CARD SET-UP

The LH 665 must be set-up to log positional data to a data card.

Step	Key	Procedure
1		Press the MENU key until the following menu selection keys are shown at the bottom of the display (screen section C): CAL. SETUP DIAG
2	SETUP	Press the SETUP key.
3		Page through the available encodement menus using the ARROW keys: APP RATE CONFIG, MARKS, CARD, LOAD CONSOLE, MEMORY, GPS, MAP
4	CARD 	Press the CARD key to display this screen:  Highlight the setting to be changed using the ARROW UP/DOWN keys.
5	EDIT	When the setting is highlighted press the EDIT key.
6	ACCEPT	Alter the setting using the ARROW UP/DOWN keys and press the ACCEPT key.
7	EXIT	When all settings have been encoded press the EXIT key.

Logging device:

Select whether yield and positional data is to be written directly to a data card if GPS equipment is connected (select MEMORY CARD) or if no data logging if no GPS equipment is connected (select NONE).

Logging interval:

This setting determines how often yield and positional data is written to the data card. The interval to select depends on the PC program being used to create field maps. Selecting 1-second intervals will probably result in more positions than the PC program needs. Ask the PC program supplier for more information.

The following shows how the logging interval and logging hours relate:

	Logging hours / logging interval		
	1 sec.	**2 sec.**	**3 sec.**
0.5 MB card	6.7	13.5	20.3
1.0 MB card	15.7	31.5	47.3
2.0 MB card	33.8	67.6	101.4
4.0 MB card	69.8	139.7	209.5

Many different file types can be stored on the data card if the data card is larger than 4MB, which makes it difficult to determine the number of logging hours per logging interval

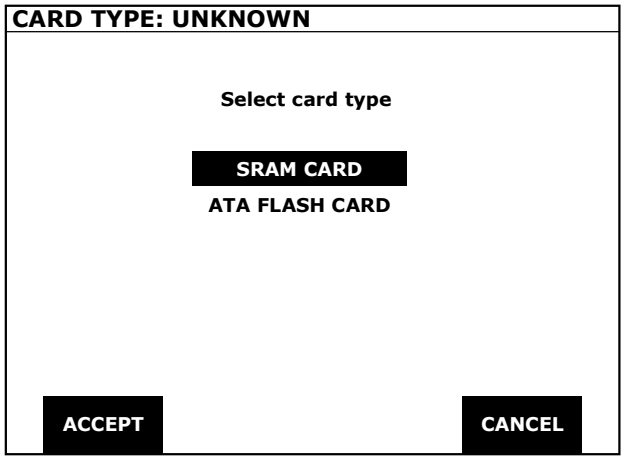
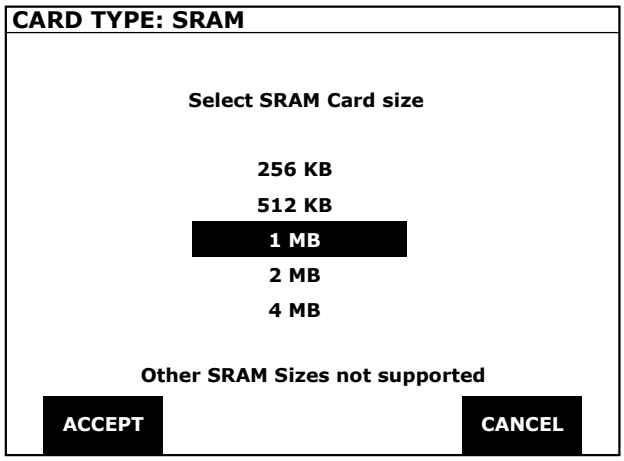
Log file:

It is possible to select which file applied rates and positional data are written in (see page 11.8).

USING DATA CARDS

THE FIRST TIME A DATA CARD IS USED

Insert the data card in the LH 665 before the unit is switched on. The LH 665 automatically determines the data card type. If the data card being used is different than the one supplied with the LH 665 then the procedure is as follows:

Step	Key	Procedure
1		Switch the LH 665 off.
2		Insert the data card and switch the LH 665 on again.
3		This screen is displayed: 
4		Select the card type being used using the ARROW UP/DOWN keys.
5	ACCEPT	Press the ACCEPT key and the following screen may be displayed (depending on data card type): 

Step	Key	Procedure
6		Select the data card size using the ARROW UP/DOWN keys.
7	ACCEPT	Press the ACCEPT key.

DATA CARD TYPES

There are two data card types that are compatible with the LH 665:

- LH Flash data card 32MB (LH no. 904-665RC). This data card is supplied with the LH 665.
- LH SRAM data card 1MB (LH no. 904-565).

The main difference is that the LH 665 can store many different log files on LH Flash data cards, but only one log file on LH SRAM data cards.

A new log file is created each day when a LH Flash data card is used. If however a LH SRAM data card is used, data will be stored in the same file until there is no more room on the data card.

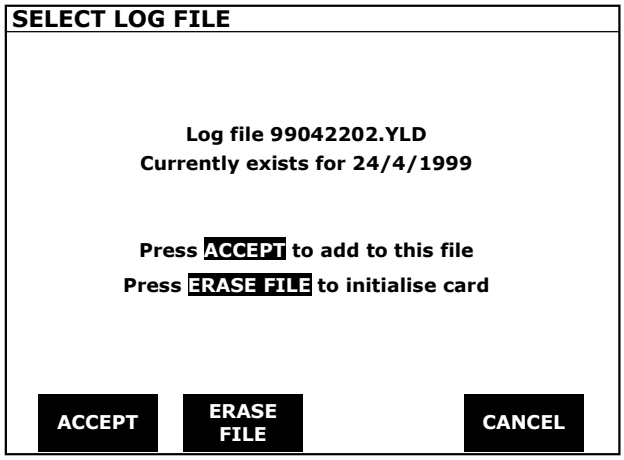
AUTOMATICALLY CREATING NEW LOG FILES FOR FLASH DATA CARDS

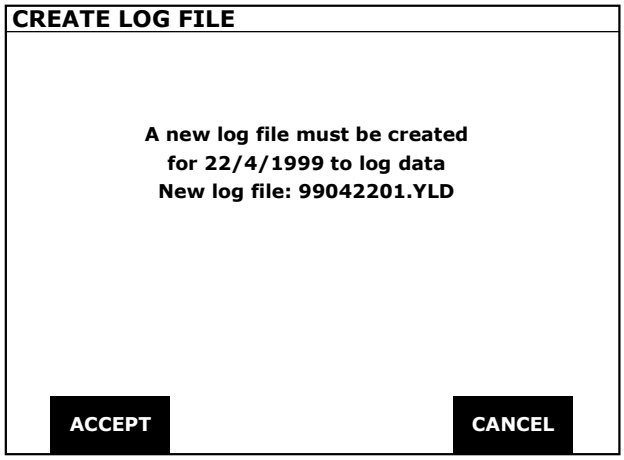
The following procedure is for when the LH 665 is switched on for the first time each day:

Step	Key	Procedure
1		Switch the LH 665 on with the card inserted.
2		After starting the following is displayed: **CREATE LOG FILE** **A new log file must be created for 22/4/1999 to log data** **New log file: 99042201.YLD** **ACCEPT** **CANCEL**
3	ACCEPT	Pressing the ACCEPT key will create a new log file for the day.

AUTOMATICALLY CREATING NEW LOG FILES FOR SRAM DATA CARDS

The following procedure is for when the LH 665 is switched on for the first time each day:

Step	Key	Procedure
1		Switch the LH 665 on with the data card inserted.
2		After starting the following is displayed: 
3	**ACCEPT**	Pressing the ACCEPT key adds data to the existing log file.
4	**ERASE FILE**	Pressing the ERASE FILE displays the following screen:

Step	Key	Procedure
5	ERASE	Pressing the ERASE key deletes the data on the card and displays the following screen: 
6	ACCEPT	Press the ACCEPT key and a new file for the day is created.

KG CALIBRATION AND DATA LOGGING TO A CARD

It is possible to copy the memory to a data card when the LH 665 is switched off.

This copying of the memory to a data card is necessary when the LH 665 is used together with DGPS equipment as the kg calibration data is also copied to the data card.

Press the COPY key and kg calibration data and the memory are copied to the data card. The LH 665 will automatically switch off after copying the data.

⚠ **The data card must not be removed until the LH 665 switches off.**

DATA MANAGEMENT

As all of the functions under CARD SETUP are similar for all operating modes they are described one by one in the following:

The following functions are found under CARD SETUP follow steps one to four on page 11.2.

COPY TO CARD

Step	Key	Procedure
1	COPY TO CARD	Pressing the COPY TO CARD key, copies all data in the LH 665 to the data card.

SHOW ALL FILES

Step	Key	Procedure
1	**SHOW ALL FILES**	Shows all files on the data card. It is possible to page through the files using the ARROW UP/DOWN keys.

ERASE ALL

Step	Key	Procedure
1	**ERASE ALL**	Removes all files found on the data card. ***Use this function with caution!***

FILE OPTIONS

Step	Key	Procedure
1	**FILE OPTIONS**	Pressing this key displays more functions for the selected file:

COPY TO FILE

Step	Key	Procedure
1	**COPY TO FILE**	Pressing this key copies all data from the LH 665 to the data card.

RESTORE FILE

Step	Key	Procedure
1	**RESTORE FILE**	Pressing this key copies the selected file from the data card to the LH 665. ***Use this function with caution! Only use this function after much thought. Loss of data will almost always occur when restoring files (depending on the age of the file being restored).***

ERASE FILE

Step	Key	Procedure
1	**ERASE FILE**	Deletes the selected file from the data card. ***Use this function with caution!***

LOG FILE

All files on the data card are shown when **EDIT** is selected for log file under CARD SETUP; it is also possible to create a new file.

CHANGING THE LOG FILE

Step	Key	Procedure
1	ACCEPT	The file to be logged to can be selected using the ARROW UP/DOWN keys.

CREATE FILE

Step	Key	Procedure
1	CREATE FILE	A new log file is created when the CREATE FILE key is pressed.

FILE NAMES

YIELD FILES

The LH 665 always names log files with the suffix YLD. The files are named after the date and the number of files on the data card with the same date. The first yield file created on, i.e. 25/07-1999 will be named 99072501.YLD. If other log files are created on the same day the last two digits will be changed, so the second log file for 25/07-1999 will be named 99072502.YLD and so on.

FILED BOUNDARY FILES

When the LH 665 is used for field boundary measurements, the log file will be saved with the suffix BDY. The files are named in the same way as yield files.

APPLICATION RATE FILES

Application rate files created on the farm's PC are named by the software used to create the task. All files of this type are suffixed TGT.

A log file is created automatically by the LH 665 when an application rate task is carried out. These log files contain information of what actually happened in the field and are named as for yield files.

NAVIGATION FILES

Navigation files created on the farm's PC are named by the software used to create the navigation file. All file of this type are suffixed PFN.

UPGRADING THE LH 665

The operating software for the LH 665 is under constant development. It is possible to upgrade the LH 665 via a data card, or via a PC connection, which means that the LH 665 can be upgraded with out removing the monitor.

The procedure for upgrading the LH 665 via a data card is as follows:

Step	Key	Procedure
1	SHOW FILES	Insert the data card that contains the upgrade file and switch the LH 665 on. Press the SHOW FILES key.
2	ACCEPT	Select the upgrade file to be used with the ARROW UP/DOWN keys, press the ACCEPT key. The LH 665 will be upgraded with the new operating software.

Each time the LH 665 is switched on it looks for a valid upgrade file on the data card. If no new upgrade file is found the LH 665 starts normally. If there is a new upgrade file on the data card and this upgrade is not required press the CANCEL key.

Upgrading the LH 665 should only be done if necessary. It is always a good idea to contact LH Agro before upgrading the LH 665.

LH Agro cannot be held responsible for any data loss in connection with upgrading the LH 665.

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